Sub C1

43. A scanning exposure apparatus comprising:

an illumination optical system, an optical axis of said illumination optical system being substantially perpendicular to a rectangular area on a predetermined plane, said illumination optical system comprising an internal reflection type integrator with an exit plane having a shape substantially equal to that of said rectangular area, and said illumination optical system illuminating said rectangular area with an illumination beam; and

a movable member arranged to relatively move a mask with respect to said rectangular area during scanning exposure on a substrate with said illumination beam through said mask, and to hold said mask at a position on or near said predetermined plane.

44. An apparatus according to claim 43, further comprising a stop member arranged between said internal reflection type integrator and said predetermined plane and arranged to limit said illumination beam in said illumination optical system.

45. An apparatus according to claim 44, wherein said stop member is substantially arranged on a pupil plane of said illumination optical system.

46. An apparatus according to claim 44, wherein said internal reflection type integrator is arranged so that said exit plane substantially conjugates with a surface of said mask.

47. An apparatus according to claim 46, further comprising:

a projection optical system arranged between said predetermined plane and said substrate, a plurality of light source images formed by said internal reflection type integrator being substantially formed on a pupil plane of said projection optical system.

48. An apparatus according to claim 47, further comprising:

another movable member arranged in a position on or near an imaging plane of said projection optical system and movable independently of said movable member, said another movable member holding said substrate.

49. An apparatus according to claim 43, further comprising an optical device arranged on said optical axis in said illumination optical system, said optical device changing an intensity distribution of said illumination beam on a pupil plane of said illumination optical system.

50. An apparatus according to claim 49, wherein said optical device selectively forms a first intensity distribution having a decreased intensity portion, the intensity of which is lower than an intensity of a portion located outer thereof relative to said optical axis, and a second intensity distribution having an increased intensity portion, the intensity of which is higher than an intensity of a portion located outer thereof relative to said optical axis.

51. An apparatus according to claim 43, further comprising:

an optical integrator arranged at a position beyond an incident plane of said internal reflection type integrator; and

a relay optical system arranged between said internal reflection type integrator and said optical integrator.

52. An apparatus according to claim 51, wherein said optical integrator has a cross sectional shape different from that of said internal reflection type integrator.

53. An apparatus according to claim 43, wherein said internal reflection type integrator comprises a glass rod.

54. A scanning exposure apparatus comprising:

an illumination optical system arranged to illuminate a slit area on a predetermined plane with an illumination beam, an optical axis of said illumination optical system being substantially perpendicular to said slit area, and said illumination optical system comprising a fly-eye type integrator having a plurality of optical elements each of which has a cross sectional shape that is substantially equal to said slit area; and

a movable member arranged to relatively move a mask with respect to said slit area during scanning exposure on a substrate with said illumination beam through said mask, and to hold said mask at a position on or near said predetermined plane.

55. An apparatus according to claim 54, wherein said slit area has a substantially rectangular shape and said movable member moves in a direction substantially perpendicular to a longitudinal direction of said slit area.

56. An apparatus according to claim 55, further comprising a stop member arranged between said fly-eye type integrator and said predetermined plane and arranged to limit said illumination beam in said illumination optical system.

57. An apparatus according to claim 56, wherein said stop member is substantially arranged on a pupil plane of said illumination optical system.

58. An apparatus according to claim 57, wherein said stop member comprises a plurality of aperture stops having shapes that are different among them, and an intensity distribution of said illumination beam on said pupil plane is changeable.

59. An apparatus according to claim 58, wherein said fly-eye type integrator is arranged so that an incident plane of said fly-eye type integrator substantially conjugates with a surface of said mask and one of said aperture stops is arranged adjacent to said incident plane.

60. An apparatus according to claim 59, further comprising:

an projection optical system arranged between said predetermined plane and said substrate, a pupil plane of said projection optical system substantially conjugating with an exit plane of said fly-eye type integrator.

61. An apparatus according to claim 60, further comprising:

another movable member arranged in a position on or near an imaging plane of said projection optical system, and movable independently of said movable member, said another movable member holding said substrate.

62. An apparatus according to claim 61, further comprising:

an optical integrator arranged at a position beyond said incident plane of said fly-eye type integrator; and

a relay optical system arranged between said fly-eye type integrator and said optical integrator.

63. An apparatus according to claim 62, wherein said optical integrator has an external form substantially equal to a cross section shape of said fly-eye type integrator.

64. A scanning exposure apparatus comprising:

an illumination optical system arranged to illuminate a slit area on a predetermined plane with an illumination beam, an optical axis of said illumination optical system being substantially perpendicular to said slit area, and said illumination optical system comprising an optical integrator arranged on said optical axis, which forms a plurality of light source images in which the number of light source images arranged in a first direction corresponding to a longitudinal direction of said slit area

is different from a number of light source images arranged in a second direction crossing said first direction; and

a movable member arranged to relatively move a mask with respect to said slit area during scanning of said illumination beam on a substrate through said mask, and to hold said mask at a position on or near said predetermined plane.

65. An apparatus according to claim 64, wherein said slit area has a substantially rectangular shape and said movable member moves in a direction substantially perpendicular to a longitudinal direction of said slit area.

66. An apparatus according to claim 65, wherein said optical integrator comprises fly-eye type integrators each of which has a plurality of optical elements having a cross sectional shape that is substantially equal to said slit area.

67. An apparatus according to claim 66, further comprising:

a projection optical system arranged between said predetermined plane and said substrate, said plurality of light source images being substantially formed on a pupil plane of said projection optical system.

68. An apparatus according to claim 67, further comprising:

another movable member arranged at a position on or near an imaging plane of said projection optical system, and movable independently of said movable member, said another movable member holding said substrate.

69. An apparatus according to claim 64, further comprising:

a second optical integrator arranged at a position beyond an incident plane of said optical integrator; and

a relay optical system arranged between said optical integrator and said second optical integrator.

70. An apparatus according to claim 69, wherein said second optical integrator has an external form different from an external form of said optical integrator.

71. An apparatus according to claim 70, wherein said optical integrator and said second optical integrator are fly-eye type integrators each of which has a plurality of optical elements, and each of said optical elements of said second optical integrator has a cross sectional shape different from a cross sectional shape of said optical integrator.

72. An apparatus according to claim 71, wherein each of said optical elements of said optical integrator has a cross sectional shape substantially equal to said slit area and said second optical integrator has an external form substantially equal to the cross sectional shape of each of said optical elements of said optical integrator.

73. An apparatus according to claim 69, further comprising:

a third optical integrator arranged at a position beyond an incident plane of said optical integrator; and

a second relay optical system arranged between said second and third optical integrators.

74. An apparatus according to claim 64, further comprising:

an optical device arranged on said optical axis in said illumination optical system, said optical device changing the intensity distribution of said illumination beam on a pupil plane of said illumination optical system.

75. An apparatus according to claim 73, wherein said optical device forms an intensity distribution having a decreased intensity portion, the intensity of which is lower than an intensity of a portion located outer thereof relative to said optical axis.

76. A scanning exposure method comprising the steps of:

illuminating a rectangular area on a predetermined plane on which a mask is arranged with an illumination beam emerging from an internal reflection type integrator, an exit plane of said internal reflection type integrator having a shape substantially equal to a shape of said rectangular area; and

relatively moving said mask and a substrate with respect to said illumination beam, respectively, to perform scanning exposure of said substrate with said illumination beam through said mask.

77. A device manufacturing method comprising a step of:

transferring a device pattern on a work piece by using a method according to claim 76.

78. A scanning exposure method comprising the steps of:

illuminating a slit area on a predetermined plane on which a mask is arranged with an illumination beam emerging from a fly-eye type integrator having a plurality of optical elements each of which has a cross sectional shape substantially equal to a shape of said slit area; and

relatively moving said mask and a substrate with respect to said illumination beam, respectively, to perform scanning exposure of said substrate with said illumination beam through said mask.

79. A method according to claim 78, wherein said slit area has a substantially rectangular shape and said mask is moved in a direction substantially perpendicular to the longitudinal direction of said slit area during said scanning exposure.

80. A device manufacturing method comprising a step of:

transferring a device pattern on a work piece by using a method according to claim 78.

81. A scanning exposure method comprising the steps of:

illuminating a slit area on a predetermined plane on which a mask is arranged with an illumination beam emerging from an optical integrator, said optical integrator forming a plurality of light source images, in which the number of light source images arranged in a first direction corresponding to a longitudinal direction of said slit area is different from a number of light source images arranged in a second direction crossing said first direction; and

relatively moving said mask and a substrate with respect to said illumination beam, respectively, to perform scanning exposure of said substrate with said illumination beam through said mask.

82. A method according to claim 81, wherein said slit area has a substantially rectangular shape and said mask is moved in a direction substantially perpendicular to the longitudinal direction of said slit area during said scanning exposure.

83. A device manufacturing method comprising a step of:

transferring a device pattern on a work piece by using a method according to claim 82.

add A3